Ehrlichiosis *(Ehrlichia spp.)*

December -2003

1) THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Of the two forms of ehrlichiosis recognized in North America as tick-borne diseases, human monocytic ehrlichiosis (HME) is caused by the bacterium *Ehrlichia chaffeensis*. Human granulocytic ehrlichiosis (HGE) is caused by a species of *Ehrlichia* that has not yet been named (but is closely related to *E. phagocytophila* and *E. equi*). Sennetsu fever, documented so far only in Japan, is caused by *E. sennetsu*. *E. ewingii* the most recently recognized human pathogen, also grows in granulocytes.

B. Clinical Description and Laboratory Diagnosis

HGE and HME affect different white blood cells, but the signs, symptoms and clinical course of the two diseases are similar. Both cause sudden illness, with fever being the predominant sign. The clinical illness is similar to Rocky Mountain spotted fever, although patients more often have low white blood cell counts and less often have rash. In addition to fever, patients may have headache, chills, muscle and joint aches, nausea and, less frequently, vomiting and loss of appetite.

The rash varies in appearance and location. Patients with HGE rarely have a rash, while about 40% with HME have a rash. Severe, life-threatening complications can occur in persons not treated early in the disease. These complications may affect the lungs, bone marrow, brain, meninges (linings of the brain and spinal cord), kidneys, and blood. Fatal infections have been reported. Both diseases generally last about 2 weeks, and patients with uncomplicated illness recover completely. Co-infections with other tick-borne agents, such as the agents of Lyme disease and babesiosis, may complicate the clinical picture.

Laboratory confirmation of ehrlichiosis requires serologic, molecular or culture-based methods. The organisms can be demonstrated in blood smears using routine Giemsa staining. Serological evaluation using indirect immunofluorescence assay (IFA) can demonstrate specific IgM and IgG antibodies in the second week of the illness. Amplification of the ehrlichial DNA by polymerase chain reaction (PCR) can detect ehrlichial DNA from clinically ill patients 3-5 weeks after the onset of symptoms. Direct isolation of organisms from the blood remains the gold standard for confirmatory diagnosis, but it is a difficult and time-consuming approach.

C. Vectors and Reservoirs

The primary vector of HME is *Amblyoma americanum*, the lone star tick. White-tailed deer appear to represent one natural reservoir for *E. chaffensis.* The vector for HGE is thought to be *Ixodes scapularis* (the deer tick), the same tick associated with Lyme disease and babesiosis. Natural animal reservoirs for HGE are most probably deer, wild rodents and elk. The primary vector for *E. ewingii* is also the lone star tick, and the dog may be a reservoir.

D. Modes of Transmission

HME and HGE are acquired from a tick bite. The duration of time the tick must remain attached before the transmission of *E. chaffeensis* or the agent of HGE occurs is unclear. Since bites from *I. scapularis* are often painless and may occur on parts of the body that are difficult to observe, cases of diagnosed HGE may have no known history of a tick bite.

E. Incubation Period

The period between infection and the first symptoms of HME or HGE appears to be 1 to 3 weeks, with an average of 12 days.

F. Period of Communicability or Infectious Period

Ehrlichiosis is not communicable from person-to-person.

G. Epidemiology

Because human ehrlichiosis has been recognized as a disease in North America only within the past decade, information about the epidemiology of the disease, its range, and the associated animal hosts and tick vectors is incomplete. In general, reported rates of ehrlichiosis increase with age; most patients with disease appear to be older adults (most often >years old). Most cases of HME have been reported from south-central and southeastern states. Most cases of HGE have been reported in Wisconsin, Minnesota, and the Northeast. On average 9 cases annually are reported to the NJDHSS. Most cases occur between April and October, when the risk of contact with ticks is the greatest.

2) REPORTING CRITERIA AND LABORATORY TESTING SERVICES

A. New Jersey Department of Health and Senior Services (NJDHSS) Case Definition:

CASE CLASSIFICATION

A. **CONFIRMED**

A clinically compatible case, **AND**

- Fourfold or greater increase in antibody titer to *Ehrlichia spp*. antigen by immunofluorescence antibody test (IFA), in acute and convalescent-phase specimens ideally taken greater or equal to 4 weeks apart. **HME** diagnosis requires *E. chaffeensis* antigen, and **HGE** currently requires *E.equi* or **HGE**-agent antigen, **OR**
- Positive polymerase chain reaction (PCR) assay for either organism, **OR**
- Intracytoplasmic morulae identified in blood, bone marrow, or CSF leukocytes, **AND** an IFA antibody titer greater than or equal to 1: 64.

B. **PROBABLE**

A clinically compatible case, **AND**

- A single IFA titer equal or greater than 1:64, **OR**
- Intracytoplasmic morulae identified in blood, bone marrow, or CSF leukocytes.

C. POSSIBLE

Not used.

Note: See Section 3C below for information on how to report a case.

B. Laboratory Testing Services Available

The Public Health and Environmental Laboratories (PHEL) currently provide testing of clinical specimens (serum) for human granulocytic ehrlichiosis and human monocytic ehrlichiosis. The PHEL also provide tick identification. For additional information on submission of samples, contact the Special Immunology Laboratory at 609.292.5819.

Mailing address is:
NJDHSS
Division of Public Health and Environmental Laboratories
Specimen Receiving and Records,
P.O. Box 361, John Fitch Plaza
Trenton, NJ 08625-0361.

3) DISEASE REPORTING AND CASE INVESTIGATION

A. Purpose of Surveillance and Reporting

- To identify where ehrlichiosis occurs.
- To focus preventive education.
- To target tick control measures.

B. Laboratory and Healthcare Provider Reporting Requirements

The New Jersey Administrative Code (N.J.A.C. 8:57-1.8) stipulates that health care providers and laboratories report (by telephone, confidential fax, over the Internet using the Communicable Disease Reporting System [CDRS] or in writing) all cases of ehrlichiosis to the local health officer having jurisdiction over the locality in which the patient lives, or, if unknown, to the health officer in whose jurisdiction the health care provider requesting the laboratory examination is located.

C. Local Department of Health Reporting and Follow-Up Responsibilities

1. **Reporting Requirements**
   The New Jersey Administrative Code (N.J.A.C. 8:57-1.8) stipulates that each local health officer must report the occurrence of any case of ehrlichiosis, as defined by the reporting criteria in Section 2A above. Current requirements are that cases be reported to the NJDHSS Infectious and Zoonotic Diseases Program (IZDP) using the *CDC Tick-Borne Rickettsial Disease Case Report Form*, or the report can be filed electronically over the Internet using the confidential and secure CDRS.

2. **Case Investigation**
   a. It is requested that the local health officer complete the *CDC Tick-Borne Rickettsial Disease Case Report Form* by interviewing the patient and others who may be able to provide pertinent information. Much of the information required on the form can be obtained from the patient's healthcare provider or the medical record.

   b. Use the following guidelines in completing the form:
      1) Accurately record the demographic information, health care provider information, whether hospitalized (and associated dates), and date of symptom onset. Check if clinically compatible illness was present (fever or rash, plus one or more of the following signs: headache, myalgia, anemia, thrombocytopenia, leukopenia,, or elevated hepatic transaminases). Ask if an underlying immunosuppressive condition was present. Specify any life threatening complications in the clinical course of illness. Record laboratory information, and outcome of disease (*e.g.,* recovered, died).
      2) Exposure history: use the incubation period range for HME and/or HGE (1–3 weeks). Specifically, focus on the period beginning a minimum of 1 week prior to the patient's symptoms onset date back to no more than 3 weeks before onset for the following exposures:
         a) Tick bite history: ask if the patient was bitten by a tick. If yes, record information about the duration of tick attachment, date(s) and geographic location(s) where patient was bitten (enter this into the "Comments" section of the form).
         b) Travel history: check if the patient traveled outside his/her county of residence within the 30 days of onset of symptoms.

c) If the patient was diagnosed at the same time with another tick-borne disease, such as Lyme disease, babesiosis, or Rocky Mountain spotted fever, please refer to the chapters on those diseases and complete the appropriate case report form.

3) The form asks whether the suspected diagnosis is HGE or HME. The vast majority of cases diagnosed in New Jersey will be HGE. If the laboratory reports clearly state that the patient was diagnosed with HGE or HME, then check the appropriate box on the case report form. Otherwise, leave this section blank.

4) If there have been several attempts to obtain patient information (*e.g.,* the patient or healthcare provider does not return calls or respond to a letter, or the patient refuses to divulge information or is too ill to be interviewed), please fill out the form with as much information as possible. Please note on the form the reason why it could not be filled out completely. **When reporting electronically, enter collected travel, exposure and clinical information into the "Comments" section.**

After completing the form, it should be mailed (in an envelope marked "Confidential") to the NJDHSS IZDP, or the report can be filed electronically over the Internet using the confidential and secure CDRS. The mailing address is:

NJDHSS
Division of Epidemiology, Environmental and Occupational Health
Infectious and Zoonotic Diseases Program
P.O.Box 369
Trenton, NJ 08625-0369

c. Institution of disease control measures is an integral part of case investigations. It is the local health officer's responsibility to understand, and, if necessary, institute the control guidelines listed below in Section 4, "Controlling Further Spread."

4) CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements (N.J.A.C. 8:57-1.10)

None.

B. Protection of Contacts of a Case

None.

C. Managing Special Situations

None.

D. Preventive Measures

Environmental Measures

To prevent ehrlichiosis, advise residents to make their yard less attractive to ticks through:

- Removal of leaf litter and brush from around the home.
- Pruning low lying bushes to let in more sunlight.
- Mowing lawns regularly.
- Keeping woodpiles in sunny areas off the ground.
- If persons are going to use acaracides (pesticides that specifically target ticks) around their home, advise them always to follow the label instructions and never use them near streams or other bodies of water.

Personal Preventive Measures/Education
The best preventive measure is to avoid tick-infested areas. In areas where contact with ticks may occur, individuals should be advised of the following:

- Wear long-sleeved shirts and long, light-colored pants tucked into socks or boots.
- Stay on trails when walking or hiking and try to avoid high grass areas.
- Use insect repellents properly. Repellants that contain DEET (diethyltoluamide) should be used in concentrations no higher than 15% for children and 30% for adults. Remember, repellents should *never* be used on infants. Permethrin is a repellent that can only be applied onto clothing, *not* exposed skin.
- After each day spent in tick-infested areas, check them self, children, and pets for ticks. Parts of the body ticks like most include the back of the knee, armpit, scalp, groin, and back of the neck. Promptly remove any attached tick using fine-point tweezers. The tick should not be squeezed or twisted, but grasped close to the skin and pulled straight out with steady pressure.

ADDITIONAL INFORMATION

An *Ehrlichiosis Fact Sheet* can be obtained from the NJDHSS website at < www.state.nj.us/health> Click on the "Topics A to Z" link and scroll down to the subject *Ehrlichiosis*.

The formal CDC surveillance case definition for ehrlichiosis is the same as the criteria outlined in Section 2 A of this chapter. CDC case definitions are used by state health departments and CDC to maintain uniform standards for national reporting. Always refer to Section 2 A for the criteria in reporting a case to the NJDHSS.

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